Running head: LEARNING PROCESSES AND APPROACHES

Learning processes and approaches: Examining their interrelationships to understand student learning

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Abstract

The purpose of this paper is to explore the relationship between two contrasting research paradigms, namely, cognitive and experiential research, a significant literature review previously unaddressed. To achieve this objective, a conceptual description of three theoretical frameworks, Dual-Store model, Levels of Processing (LOP; drawn from cognitive psychology) and Students Approaches to Learning (SAL; drawn from experiential research) was undertaken. Then, the relationship between Dual Store Model and LOP and a relationship between SAL and LOP is explained using research in cognitive and educational fields. Articles for this review were retrieved from three electronic databases, viz., PsycINFO, ERIC and Google Scholar. These were searched using variations and Boolean connections of key terms, Dual-Store model, Levels of Processing, Students Approaches to Learning, Learning Strategies and literature review. Results suggest a significant amount of overlap between the concepts related to student learning within these theoretical frameworks and their contribution in understanding student's study processes. This review examines students' learning processes from an internal perspective. Future research examining study processes from the external perspective, such as investigating the influence of teaching methods and assessment methods on students learning processes could be beneficial.

Key Words: Dual-Store model, Levels of Processing, Students Approaches to Learning, Learning Strategies, literature review.

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Researchers from around the world have been conducting studies on university students' learning processes and behaviors (Atkinson & Shiffrin, 1968; Biggs, 1987; Craik & Lockhart, 1972; Entwistle & Ramsden, 1983; Marton & Saljo, 1976a; Schmeck, Ribich, & Ramanaiah, 1977). Some emphasized on information processing, where the study processes' dimensions are estimated from major theories of human learning (Entwistle & Ramsden, 1983; Schmeck et al., 1977), while some others emphasized on learning approaches, where the dimensions of study processes are derived from qualitative and quantitative analysis of students' reports of their own study processes (Entwistle & Waterston, 1988). Understanding these contrasting research paradigms and the different terminologies used by them to explain student learning behaviors may help the educators and researchers to appropriately interpret the various constructs related to these paradigms (Biggs, 1993).

Despite the utility of literature reviews on theoretical frameworks drawn from cognitive psychology, to date, none have been found that examined the relation between the theoretical frameworks drawn from both cognitive and experiential research. Therefore, a considerable uncertainty remains regarding the contributions of these contrasting paradigms in combination to understand student learning behaviors.

Thus, the purpose of the present review was to explore the relationship between cognitive and experiential research and to evaluate whether one of these fields might contribute to the understanding of the other in terms of student learning behavior. To meet this purpose, a conceptual description of three theoretical frameworks, Dual-Store model, Levels of Processing (LOP; drawn from cognitive psychology) and Students Approaches to Learning (SAL; drawn

from experiential research) was undertaken. Then, the relationship between these three frameworks was investigated, along with their role in understanding student learning.

The literature for this review was retrieved by conducting searches in three electronic databases (PsycINFO, ERIC and Google Scholar), using variations and Boolean connection of key terms: dual-store model, levels of processing, students learning approaches and learning strategies. Furthermore, snowball technique was used to retrieve additional publications. Only peer-reviewed journal articles were included in this review.

Description of Dual Store Model

Dual-store model was proposed by Atkinson and Shiffrin (1968) according to which human memory has three components: sensory register, working memory (also referred to as short term memory) and a long term memory (LTM) (Atkinson & Shiffrin, 1968). According to this model, information from the environment enters sensory register, even if sometimes we are not mentally present, and stays there long enough for it to be able to be cognitively processed. However, if information is not paid attention to, it gets lost in a few seconds. Information moves from sensory register to working memory when the individual pays attention to that information. Working memory is the component of memory where "thinking" (p. 176) occurs. It stores the information and processes it. It also stores and processes the information retrieved from LTM, which helps in interpreting newly received information from the environment. Working memory is portrayed as playing the role of central executive, controlling and monitoring the flow and use of information throughout the memory system. A further processing is required for information to go from working memory to LTM, and typically such processing involves combining new information with information already in LTM. In other words, people store information in long-term memory most successfully when they relate it to things they already know (Ormrod, 1999).

The distinction between sensory register, working memory and long term memory (LTM) are well documented in Ormrod (1999). While sensory register has unlimited capacity, working memory's capacity is considered to be between 5 and 9 units of information at a time and LTM's capacity is considered to be unlimited (Ormrod, 1999). Duration of the information in each store is very distinct. In sensory register, information fades away quicker than in working memory. In working memory, the information fades away much quicker than that from LTM. In LTM, information is considered to fade very slowly or remain permanently (Ormrod, 1999).

Description of Levels of Processing

Craik and Lockhart (1972) developed a human memory model based on the notion that the perceptions involve rapid analysis of stimuli at various levels (Craik & Lockhart, 1972). Their model involves a continued hierarchy of processing stages, where preliminary processing stages involve recognition of basic characteristics of stimuli such as lines, angles, brightness, pitch, and loudness; later stages include pattern recognition and meaning extraction and much later stages of processing involve deeper elaboration of the recognized pattern. It is suggested that the result of continued processing of information is the memory trace. Stronger and long lasting memory trace is a result of deeper levels of analysis (Craik & Lockhart, 1972).Similarly, it may be concluded that surface level of analysis might be related to weaker memory traces that fades away quickly.

Further, Schmeck (1983), using Inventory of Learning Processes (ILP), identified four levels of processes, namely, deep processing, elaborative processing, fact retention and methodical study that students adopt to tackle everyday studying and labeled them as learning strategies (Table 1). Learning strategies refer to behaviors of a learner that are intended to influence how the learner processes information (Mayer, 1988).

Table 1. *Definitions of Levels of Processing* (Schmeck, 1983)

ILP factors	Definitions
Deep Processing	It describes the extent to which a student critically evaluates, conceptually organizes, has a tendency to extrapolate beyond the specific information and instruction provided by a teacher, and compares and contrasts information being studied.
Elaborative Processing	This suggests an experiential, self-involving and self-referencing approach to learning
Fact retention	preference for learning `facts' such as prepared statements, summaries, definitions, formula, etc.
Methodical study	meticulous study methods

Description of Student Approaches to Learning

Research on Students' Approaches to Learning (SAL) began with the seminal work of Marton and Saljo (1976a), who identified qualitative differences in learning among students in terms of different levels of processing proposed by Craik & Lockhart (1972). Marton and Saljo's study (1976a) was based on the premise that it is inadequate to simply examine the learning outcomes in terms of quantitative terms like the number of correct answers to a test. Rather, for understanding student learning strategies, it is preferable to seek the description of "what" the students learn as opposed to "how much" they learn (Marton and Saljo, 1976a). In their first study, conducted on a group of forty female Swedish university students, individual students were asked to read one or more prose passages and then asked questions about the meaning of the passages and about how they set about reading them. More specifically, the students were given a series of open questions to elicit how they tackled the reading process and also questions to assess what had been understood. The analysis of the student responses showed that there exist distinct differences amongst individual students in terms of how they comprehend the task given

to them. In comprehending and analyzing a prose passage, there existed different levels of outcomes related to the responses, where the responses of certain students showed that the students grasped the essence of the subject as opposed to just reading the text given to them. The responses of the other group of students were limited to the text given to them and were devoid of any comprehension. These differences in the qualitative aspects of the learning strategies pointed towards a corresponding difference in how the students process their information, which the authors classified as two distinguishable levels of processing namely, *deep-level processing* where the learning strategy of the student was directed towards content of the learning material and *surface-level processing*, where the student's learning strategy focused on learning the text forcing to keep a reproductive or rote-learning process (Marton & Saljo, 1976a).

Marton and Saljo (1976b) conducted a follow-up study to examine learning outcomes as a function of how the students conceptualize or understand the demands of the task given to them. In this study, a sample of forty first-term female Swedish university students were divided into two groups of twenty each and made to read three sections of a textbook. The first group received questions which demanded a thorough understanding of content, while the second group was given factual questions. After this exercise, both groups were asked to summarize the main points learned. The authors aimed at inducing the deep and surface level processing by designing the demand tasks in the form of questions which would influence the students to adopt only one form of the learning process. The findings of the study indicated that students modify their regular learning strategies in order to fulfill the task requirements as they experience them. The group who were given questions that demanded a thorough understanding of content, showed students consciously employing deep processing methods, while the other group that were given questions emphasizing on factual knowledge employed surface processing methods.

This contextual dependence of a student's learning approach led the authors to conclude that students' motives or intentions of deciding the type of learning process to employ were influenced by the task demands (Marton & Saljo, 1976b).

In summary, it was found that students employed two distinct learning strategies when approaching a learning task, the first of which focused on understanding the underlying meaning of the learning material, while the second focused on rote-learning for precise reproduction. Thus, the findings of Marton and Saljo (1976a, b) laid the foundations for future studies aimed at understanding students' learning approaches.

Biggs (1987) continued Marton and Saljo's (1976a, b) research on Students Approaches to Learning (SAL), but from a different perspective, by designing a questionnaire to measure students' approaches to learning (Biggs, 1987). He defined SAL as a combination of a motive and a strategy (Biggs, 1987). Motives are the motivations or intentions of the students for undertaking a task. According to Biggs (1987), there are three types of motives, namely, deep, surface, and achieving. A student, who has a deep motive, might be interested in the subject area and wants to study for understanding. While on the other hand, a student who has a surface motive may not be interested in the subject matter, rather aims at meeting minimum requirements to pass the course. Similarly, a student with achieving motive would be stimulated by achieving higher grades or accolades instead of interest in the subject area (Biggs, 1987).

Each of these learning motives, according to Biggs (1987) is expressed through a corresponding learning strategy. Learning strategies are the methods utilized by students to fulfill their motivations for studying (Biggs, 1987) and accordingly influence the manner in which the learner processes information (Mayer, 1988). Students with deep motives would employ deep learning strategies by reading widely and integrating new information with previous knowledge.

Students with surface motives would employ surface learning strategies by reading minimally to meet the course requirements. Similarly, students with achievement motive would employ achievement learning strategies by being strategic about their reading process to achieve highest grades. Biggs (1987) suggested the importance of a congruency between students' motives and the learning strategies that students apply. For example, a student with deep motives, but employing surface strategies, would likely be unsatisfied with their understanding of the subject matter. Similarly, a student with achieving motives, but using surface strategies, would be unlikely to feel satisfied with the outcome of their learning.

Table 2. *The motives and strategies in students' approaches to learning*. Adapted from Biggs (1987).

Approach	Motive	Strategy
Deep	Intrinsic: study to actualize interest and competence in particular academic subjects.	Read widely, inter-relate with previous relevant knowledge
Surface	Instrumental: meet requirements minimally; a balance between working too hard and failing	Limit target to bare essentials and reproduce through rote learning.
Achieving	Obtain highest grades, whether or not subject is interesting	Strategic, organize time, follow up all suggested readings, behave as 'model student'

Further work on students learning approaches was undertaken by Entwistle and his colleagues, using a similar approach to Biggs (1987), that is, by developing a questionnaire, namely 'Approaches to Studying Inventory'(ASI) (Entwistle & Ramsden, 1983).Using ASI, Entwistle and Ramsden (1983), found four types of learning approaches: deep, surface, achieving and non-academic. Entwistle and Ramsden (1983) define achieving approach in similar fashion as Biggs (1987) achieving approach, emphasizing that students with achieving approach focus on employing study strategies that would maximize their grades. The non-

academic approach, according to Entwistle and Tait (1990) include lack of motivation, negative attitudes, and disorganized study methods. Further, the deep and surface learning approaches proposed by Entwistle and his colleagues resemble the definitions of those proposed by Marton and Saljo (1976a, 1976b) and Biggs (1987). According to Entwistle and his colleague, a deep learning approach involves reading for understanding, actively processing the information, making connections between the previously learned materials with the current knowledge. Conversely, a surface learning approach includes employing rote learning to process the information (Entwistle & Ramsden, 1983).

Relationships

What is the relationship between Dual Store Model and LOP?

A relationship between LOP and Dual store model was investigated using learning strategies (Mayer, 1988). Learning strategies are the behaviors of learners that influence how the learner processes information (Mayer, 1988).

When the information from outside world, such as a teacher's lecture enters dual store model through the sensory memory, it is essential that attention be paid to that information so as to prevent it from fading and to move it from sensory memory to short term memory (STM) (Atkinson & Shiffrin, 1968). According to Mayer (1988), the learner's learning strategies aimed at the process of attention, determines how much and what kind of information reaches STM. For example, if a learner is interested in the information, he/she may pay more attention to it, transferring more information to STM. Similarly, if the learner pays more attention to the grammar instead of the gist of a paragraph, then grammar related information will be transferred to the short term memory (STM) (Mayer, 1988).

Because STM has limited capacity, the information that reaches it needs to be continuously rehearsed to prevent it from fading away. Levels of processing (LOP) that include rehearsal processing, determine the amount of information that would be maintained in short term memory (STM) of dual store model (Mayer, 1988). Thus, more the rehearsal process, more the information that would be maintained in STM (Mayer, 1988). Individuals can be taught to rehearse the material for basic and for complex tasks (Weinstein & Mayer, 1983). Rehearsal strategies for basic learning tasks include, for example, memorizing a list of names (Weinstein & Mayer, 1983). Rehearsal strategies for complex tasks would include teaching how to copy or underline the information (Weinstein & Mayer, 1983).

Information in STM disappears once the process of rehearsal stops (Mayer, 1988). To retain the information for longer period of time or permanently and to retrieve it in future, the information needs to undergo further processing. Learning strategies aimed at the levels of processing (LOP) that include elaboration and organization, impact how the information will be stored and retrieved from long term memory (LTM) of dual store model for future use (Fowler, 2003; Mayer, 1988). Elaboration strategies for basic tasks involve relating the items in each pair or forming mental images (Weinstein & Mayer, 1983). Elaboration strategies for complex tasks involve paraphrasing, summarizing or relating new information with prior knowledge (Weinstein & Mayer, 1983). Organizational strategies for basic tasks involve grouping or ordering to-be-learned items from a list, whereas organization strategies for complex tasks involve creating flowcharts to show relationships (Weinstein & Mayer, 1983).

What is the relationship between Learning Approaches and Levels of Processing?

Relationship between student's approaches to learning (SAL) and levels of processing (LOP) was investigated empirically by Entwistle and Waterston (1988; Appendix 1). Authors

created a shortened version inventory (75 items) by combining Inventory of Learning Processes (ILP) and Approaches to Studying Inventory (ASI) scales, along with an additional scale on social motivation. This shortened inventory was administered on 218 volunteer students from science, arts and social science disciplines at Edinburgh University (Entwistle & Waterston, 1988). Results of Inter-correlations suggested a high correlation between surface processing and surface approach (r=0.5), fear of failure (0.47) and improvidence (0.51). On the other hand, Elaborative Processing was found to have high correlations with deep approach (0.64) and intrinsic motivation (0.50). The results of the principle component factor analysis were similar to the results of inter-correlations, where surface processing indicated high factor loadings with reproducing orientation and elaborative processing with meaning orientation. The factor analysis further suggested an overlap between deep processing, elaborate processing, organized study methods and analytical thinking (Entwistle & Waterston, 1988).

This study was significant in measuring study processes and approaches to studying from two different theoretical frameworks. The results were informative in conveying that irrespective of contrasting theoretical frameworks, the way a student learns is similar. However, there is a possibility of obtaining biased results as this study involved volunteers and a small sample size. Secondly, the sample was obtained from science, arts and social science alone. Whether the findings of this study would pertain to sample from other disciplines is dubious. Further, unlike ILP, ASI has not been confirmed among students in USA (Entwistle & Waterston, 1988). Thus, whether the same conclusions can be drawn regarding USA students is questionable and requires a further research in this area. In spite of these limitations, this study is one of the significant demonstrations of combining factors of student learning from two different frameworks.

Speth and Brown (1988) conducted a similar study with students from United States. This study involved the comparison of inventories from three theoretical perspectives, namely, cognitive processes, student approaches to learning (SAL) and autonomous studying. It attempted to identify similarities and dissimilarities among these frameworks to describe important facets of study activity. Approaches to studying inventory (ASI) was used with some changes in the wordings of items. 30 inventory of learning processing (ILP) items were taken by retaining the wordings but doing reverse coding. A test preparation activities survey was developed by adapting 55 items from Study Activity Survey Form T, appropriate for college students. This combined version of inventory was administered on 383 educational psychology students. Factor analysis of items indicated Factor 1 to be representative of reproducing orientation, involving difficulty with eight ILP items: essay test, learning how to study for each course, remembering, comparing concepts, making inferences, organizing, critical evaluation and finding the right words. Additionally, seven ASI items loaded on this factor, including fear of failure, test anxiety, tension and depression, getting distracted easily, feeling a need to memorize to survive, introducing irrelevant material into essays, and inability to see the overall picture. Elaborative Processing items from ILP loaded highly with Deep Approach items from ASI, and included visualizing, problem-solving, summarizing and learning the material in one's own words. Factor analysis of subscales also indicated similar results, with positive factor loadings between Elaborative processing (ILP), Meaning-oriented subscales (ASI) and intrinsic motivation. Reproducing subscales had negative loadings with elaborative and deep processing, but, positive loadings with surface approach, fear of failure, improvidence, disorganized study methods, syllabus-boundness, negative attitudes and globetrotting, thus indicating a clear distinction between deep and surface processes (Speth & Brown, 1988).

The findings of this study are in accordance with the findings of Entwistle & Waterston (1988). In both the studies, surface processing of ILP has been shown to be related to reproducing orientation of ASI. Similarly, in both the studies, a relation was indicated between Elaborative Processing, Meaning Orientation and positive attitudes to studying. Again the presence of deep and surface approaches has been confirmed. In Entwistle & Waterston's (1988) study, there was a doubt regarding usage of ASI with American students, however the precision of results in the study by Speth and Brown (1988) do support the usage of ASI with American students. Nonetheless, the results of this study are limited by the usage of small sample size and recruiting the subjects from educational psychology classes alone. Further, no information has been provided either regarding the recruiting method or regarding the item selection process for the shortened inventory used.

Cano-Garcia and Justicia-Justicia (1994), examined interrelationships between learning strategies, styles and approaches by conducting an extensive study using complete versions of Inventory of Learning Process, Learning and Study Strategy Inventory, Approaches to Studying Inventory and Learning Styles Inventory. The authors used a much larger sample size of 991 students in ten disciplines at the University of Granada, Spain. The results obtained confirm the studies of both Entwistle and Waterston (1988) and Speth and Brown (1988). Deep processing exhibited high factor loadings with selecting main ideas, fact retention and low anxiety. Meaning orientation had high loadings with elaborative processing. An important connection was seen among elaborative processing, deep approach, relating ideas and intrinsic motivation. Surface approach was grouped together with extrinsic motivation, fear of failure, improvidence, and syllabus boundness, along with deep processing with a negative sign. Factor II involved surface

approach and extrinsic motivation and factor III contained deep approach and intrinsic motivation (Cano-Garcia & Justicia-Justicia, 1994).

This study as opposed to the above two studies, indicates a direct relationship of extrinsic motivation with Surface approach and syllabus boundness. The reason for such discrepancy could be because Entwistle and Waterston (1988) and Speth and Brown (1988) used a smaller sample size, shortened versions of ILP and ASI and also the samples were limited by their educational disciplines (Cano-Garcia & Justicia-Justicia, 1994).

In summary, it may be concluded that deep approach (SAL) is related to elaborative processing (LOP),and deep processing (dual-store model).On the other hand, surface approach (SAL) is related to fact retention (LOP), and surface processing (dual-store model).

Findings

Relationship between Dual-Store Model, LOP and SAL

Dual-Store model helps in understanding the type of levels of processing (LOP) and student approaches to learning (SAL) that are required to transfer information from one memory store to another. Thus, the Dual-Store model helps in understanding the type of LOP and SAL that should be adopted by students in order to attain higher learning outcomes. For example: to store the information permanently in LTM and to successfully retrieve the information from LTM for future use, deep learning approaches are required (Mayer, 1988). Similarly, SAL and LOP help in understanding the type of processing that is required to transfer information from one memory store to another of Dual-Store model (Mayer, 1988). Thus, it may be proposed that all the three frameworks, that is, the dual-store model, LOP and SAL, though originating from contrasting research paradigms, are all interrelated (Figure 1). In the schematic representation below, the bidirectional arrows indicate that all the three frameworks are related to each other.

Thus, it may further be proposed that all the three different frameworks make significant contributions in understanding student learning.

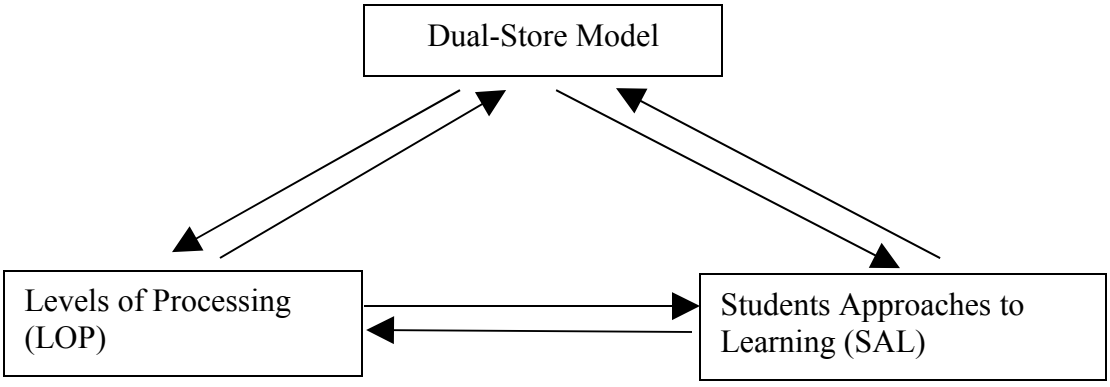

Figure 1. Proposing Inter-relationship between dual-store model, LOP and SAL

Based on the above proposal, two hypotheses have been proposed:

Hypothesis I

Once the information reaches short term memory (STM) of Dual-Store model, it needs to be transferred to long term memory (LTM), for which elaboration and organizational processing is required (e.g. Mayer, 1988).

Students adopting deep approaches to learning (SAL framework) use elaboration and organizational processing (e.g., Entwistle & Ramsden, 1983; Speth & Brown, 1988).

Based on these findings, it can be hypothesized that students need to adopt deep approaches to learning (SAL) or elaboration processing (LOP) for the information to retain longer or permanently in LTM or to retrieve it successfully for future use.

Hypothesis II

Information remains in short term memory (STM) of Dual-Store model as long as it is being rehearsed. The termination of the rehearsal processes results in the fading away of information. To prevent the information from fading away, it needs to be further processed

through levels of processing (LOP) that involves elaboration and organizational processes that ensures its movement to long term memory (LTM) (e.g., Mayer, 1988).

However, surface approach to learning that involves rehearsal strategies (Biggs, 1987) was found to be negatively correlated to elaboration processing (e.g., Entwistle & Waterston, 1998).

Based on these findings, *it may be hypothesized that students who adopt surface approaches to learning (drawn from SAL) or rehearsal strategies (drawn from LOP), forget information quickly.*

Role of Dual-Store model, LOP & SAL frameworks in understanding student learning

In order for information to be retained permanently or for a longer period of time, it needs to be transferred to LTM of Dual-Store model (Atkinson & Shiffrin, 1968). This requires higher levels of processes (LOP) such as deep processing (Mayer, 1988). Research studies found that rehearsal methods lead to lower learning outcomes (e.g., Ramsden, 1991). The findings of the present study concur with these findings, as the rehearsal methods can help to maintain information in STM, but cannot transfer it to LTM which leads to fading away of information, thus leading to lower level outcomes. However, the findings of this study indicate that rehearsal methods are also important, as they help to maintain information in STM which is a crucial step before the information is transferred to LTM (Mayer, 1988). Thus, it may be concluded that a learner should start with rehearsal strategies, but go beyond rehearsal to higher level of process, such as deep processing and student learning approaches such as deep approach (Mayer, 1988). This finding echoes with the previous findings related to student learning approaches (SAL) (e.g. Biggs, 1999).

The findings of this review suggest that deep learning approaches lead to retaining the information for longer periods or permanently in long term memory (LTM) and also for retrieving for future use, thus leading to good performance in studies (Mayer, 1988). This is in general agreement with previous findings that suggest that deep learning approaches lead to higher learning outcomes (e.g. Marton & Saljo, 1976a; Ramsden, 1991). Thus, it is imperative that students need to adopt deep learning approaches to be academically successful.

Conclusion

This review contributes to the literature by performing two distinct tasks. Firstly, it identifies the relationship between three theoretical frameworks, namely, dual-store model, LOP and SAL, originating from contrasting research paradigms. Secondly, it examines the role of these frameworks in understanding student learning processes and behaviors.

The search strategies might have led to overlooking of specific studies critical for this review. Despite this limitation, the present review contributes to the literature by proposing an interrelationship between three frameworks, namely, dual-store model, LOP, that are drawn from cognitive psychology and SAL, drawn from experiential paradigm. Additionally, this review hypothesizes that students who adopt deep approaches to learning (SAL) or elaboration processing (LOP) retain information for a much longer time (dual-store model) when compared to students who adopt surface learning approaches or rehearsal strategies.

Furthermore, whether students adopt deep learning approaches or not also depends on the environmental factors such as teaching methods, assessment methods and curricula (e.g., Biggs, 1999). Therefore, while conducting research on promoting high quality education, emphasis should be placed on classroom learning environmental factors along with students study processes. This claim matches with the findings of Entwistle and Waterston (1988).

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Appendix 1

Author (s) / year/ journal	Title	Purpose	Method	Sample size and characteristics	Statistical analysis	findings	Strengths and weaknesses	Claims
Entwistle & Waterston / 1988/ British Journal of educational psychology	Approaches to studying and Levels of processing in university students.	Comparing two student learning inventories (ILP & ASI), derived from two contrasting theoretical rationales, one from cognitive psychology and other from experiential research.	60 items from ILP & ASI and 15 new items are used to develop a 75 item inventory .	218 volunteers, Ist year Edinburgh students from science, arts and social science disciplines.	Confirmatory Factor analysis Internal Reliability (r>0.7), Inter correlations	1. Surface processing = surface approach =reproducing orientation = fear of failure; 2. Elaborate processing = deep approach = intrinsic motivation = meaning orientation. 3. Disorganized study habit = disorganized approach 4. Fact retention ≠ approach to studying	Laid foundation for further research on this topic. Sample bias = small sample + volunteers. Study conducted on science, arts and social science students. These findings whether pertain to students from other disciplines is still questionable	Both, students study processes and learning environment impact students learning. Thus, any attempts to modify students' study strategies should take both these factors into consideration. Unlike ILP, ASI has not been confirmed among students in USA. Thus, whether these results will be applicable to US students is still questionable and future research needs

							No description of the items included.	to focus on this.
Speth & Brown/ 1988/ British Journal of educational psychology	Study approaches, processes and strategies: are three perspectives better than one?	To compare inventories from 3 theoretical perspectives: cognitive processes, SAL, and autonomous studying, to identify similarities and dissimilarities in how they attempt to describe important facets of study activity, and to see if one might contribute to the understanding of other two	Inventories used were: ASI items with some changes in the wordings, 30 ILP items, A test preparation activities survey	383, Educational psychology students from a US university.	Factor analysis	1.Surface Processing = Reproducing Orientation ≠ Elaborative and deep processing; 2. Elaborative Processing = meaning orientation = intrinsic motivation; 3. Surface approach= fear of failure = disorganized study methods	Sample bias = small sample + used only educational psychology students.	Of the three perspectives, the approaches to studying seemed to furnish the best interpretive framework for understanding the other two.
Cano-Garcia,	Learning strategies,		Learning styles	991; 10 disciplines at	Factor analysis	Deep Processing =	Findings are more	

Justicia-Justicia/ 1994/ Higher Education	styles and approaches: an analysis of their interrelation-ships		inventory, LASSI ASI and ILP are used	the University of Granada, Spain		selecting main ideas = fact retention = low anxiety. Surface processing = surface approach = fear of failure = improvidence; ≠ deep processing; Elaborative Processing = Meaning orientation = Deep Approach = Relating ideas = intrinsic motivation.	reliable because of usage of much larger sample size, from 10 different disciplines, and usage of four instruments (ILP, LASSI, ASI & LSQ).	